

Where do we go From Here?

by **Todd Kolmodin**
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This month, Gardien's resident expert Todd Kolmodin answers questions as posed by Dan Beaulieu of DB Consulting about the future of electrical test.

Dan: Todd, do you see E-test as something that stays in the board shops or something that eventually gets so high-tech that it has to be done by experts?

Todd: That's a great question. Technology is evolving so fast now that there will be a break-point as to whether a board shop can continue to successfully test the product they are building with the equipment they have. Advances in PCB technology are quickly pulling ahead of many of the older grid test machines and forcing more of the product to flying probes, which can cause issues in capacity and velocity for testing product and force new capital investments in electrical test equipment. This can be a difficult position for a board shop as this capital expense is difficult to justify. Capital for ET machines in one sense is buying an insurance policy rather than adding any "value-

add" to the PCB itself. This can be a very difficult decision for manufacturing budgets. So it is fairly safe to project that as we continue on this technology roadmap we will see more outsourcing; as for the manufacturer, it is more cost effective on the bottom line.

Dan: Do you see the equipment itself getting more sophisticated and thus very expensive?

Todd: The test equipment manufacturers will still try to make the equipment as affordable as possible, but the demands of technology are still to be addressed. In Asia, the use of quad-density grid testers and automated dedicated testers is the norm. Here in North America we have not seen too much of this technology as of yet. I have recently seen some new designs here in the U.S. that the standard double-density grid test machine cannot even test. This forces the flying probe. Soon, the need for the quad density machines will be required to effectively provide the economical test solution. This also means capital investments and yes, these machines do have higher price tags.



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Dan: What about people? Are people going to need to be better trained in the future? Will E-test get more difficult for the non-technical people to use?

Todd: Yes, we are seeing some of this today. It has been the misnomer in the past that anyone can run a test machine and in some sense that is true; but today there is much more to the equation. Many times historically there is a supervisor (expert) on the floor that sets product up and the operator then just pushes buttons. This is not efficient in today's environment. Operators need to understand prints/drawings, set up their own machine and understand what the machine is telling them. This makes the operation more efficient, reduces delays due to false calls from the testers and allows the floor supervisors to focus on higher level issues. Efficient training is absolutely critical.

Dan: I know that in some instances when independent test service companies are actually going to take over the test departments of board shops. In the spirit of full-disclosure here, I know that your company is doing some of this already, so do you think there will be more of what I call embedded services, in the future?

Todd: I think this is inevitable. The sheer cost of capital equipment, staff and understanding specification requirements is making this function cost prohibitive within the individual manufacturing plant. All manufacturers have their FA department to review the final product for dimensional, finish, copper thickness and all other physical attributes. However, the difficulty is fully making sure all the electrical attributes are covered. We take that worry away from the manufacturer. We know the specifications; we understand the prints and customer electrical requirements.

Dan: Can you talk a little bit about new and more sophisticated types of testing will be done in the future?

Todd: There have always been more intensive tests available but in recent times we are

seeing the design shops call on these tests. This includes IR (insulation resistance) testing, selective high-voltage testing, which is not to be confused with hi-pot dielectric withstanding testing. Designers are reducing the size of the PCB and this has reduced internal core thicknesses. Cores that are .002" (80 µm) and below cannot withstand the standard high-voltage hi-pot parameters that originally were called out by IPC-TM-650, so awareness and care must be taken when testing these designs. Buried passive testing is now more common and this can be both resistive and capacitive. The test department must be able to identify these characteristics and provide the optimal and correct test solution.

Dan: Let's look into that proverbial crystal ball; where do you see E-test in five or 10 years?

Todd: That is a difficult one. Technology is advancing so quickly that one could make an argument that the standard grid test machines in North America could very well be obsolete in the next five years or less. Although bed-of-nails test in North America remains stable at this point they will have to evolve in the near future. Asia has already made this leap and bed of nails machines of quad density are the norm, if not the requirement. Flying probes will cover the solution in the interim period but there will be the need for quad and ultimately, octal-density test machines. The other option is the return to dedicated fixturing and dedicated machines which use wired technology fixtures and can provide the density requirements of these new and emerging designs.

Dan: Thanks Todd, Very interesting and informative, as always. PCB



Todd Kolmodin is the vice president of quality for Gardien Services USA, and an expert in electrical test and reliability issues. To read past columns, or to contact Kolmodin, [click here](#).